4. <u>Remarks</u>

.Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons set forth below.

A. Allowance of Claims 2, 3, and 11 to 13

Applicant thanks the Examiner for the conditional allowance of claims 2, 3, and 11 to 13, the condition being that the double patenting rejection be overcome and that the claims be rewritten in independent form. Applicant has responded positively to overcome the double patenting rejection (see the discussion of the double patenting rejection presented below). For the time being, applicant has left these claims in dependant form, since applicant believes the claims they depend upon are also patentable (see the discussion of the 102(e) rejection presented below).

B. Amendments To The Specification To Complete Citations

The specification has been amended in two separate paragraphs, one beginning on line 4 of page 1 and another beginning on line16 of page 6 (paragraphs [0001] and [0026] in application publication US 2002/0152431), to expand the citations of three other patent applications of the present inventor -- citations intended to incorporate these other applications by reference into the present application. These citations have been expanded so that they now include both the serial numbers and also the Patent Application Publication Numbers of these other patent applications, in addition to the application titles and filing dates. The Attorney Docket Number application citations have been deleted. The title of one of the cited applications has also been corrected.

Approval of these corrections and their entry into the specification is respectfully requested.

C. Corrections to the Drawings

Attached to this document, as its last three pages (Appendix B), are three replacement sheets of drawings which, as was explained above, add three missing reference numbers to the drawings and also add a question mark to an interrogatory phrase in one drawing. Approval of these changes to the drawings is respectfully requested.

D. Double Patenting Rejection of Claims 1 to 15

The Examiner has rejected all of the claims 1 to 15 provisionally under the judicially created doctrine of obviousness-type double patenting in view of claims 1 to 15 of co-pending application Serial Number 09/833,771 (hereinafter "the '771 application"). For the Examiner's convenience, claims 1 to 15 of the '771 application, as recently amended, are set forth in Appendix A. The '771 application, as amended, has recently been allowed but has not yet issued as a patent. Reconsideration of this grounds for rejection is respectfully requested.

In response to this rejection, and after carefully comparing and contrasting the claims 1 to 15 of the present application with amended claims 1 to 15 of the '771 application, applicant has carefully amended independent claims 1, 6, and 9 and also dependent claims 10, 14, and 15 to more clearly distinguish the invention claimed in the present application from the different invention claimed in the '771 application (as recently amended). Dependent claims 3 and 11 to 13 have also been amended in small ways to improve their language and to make them consistent with the other amended claims. Claims 5 and 8 have been canceled. The Examiner is invited to compare newly amended claims 1 to 4, 6 to 7, and 9 to 15 of the present application with claims 1 to 15 of the '771 application which are presented in Appendix A.

The invention claimed in the present application differs from that claimed in the '771 application in three major respects, as is summarized in the next three paragraphs:

Structural elements: Claims 1 to 4, 6 to 7, and 9 to 15 of the present application each call for a single network that is supplied with heartbeats generated by two separate processes

operating on two separate hosts. In contrast, the claims 1 to 15 of the '771 application call for two separate networks that each receive heartbeats from a single process running on a single host.

No heartbeats received condition: Claims 6 to 7 and 9 to 15 of the present application proclaim a NETWORK failure when no heartbeats are received from either of two separate processes operating on two separate hosts and flowing over a single shared network. Contrary to this, Claims 6 to 15 of the '771 application proclaim a PROCESS failure when no heartbeats are received from either of two separate networks, the heartbeats originating from a single process.

Heartbeats received from only one of two sources: Claims 1 to 4, 6 to 7, and 9 to 15 of the present application proclaim a PROCESS failure when a heartbeat is received from one process operating on one host but not from another separate process operating on a separate host, the heartbeats flowing over one network. Contrary to this, claims 1 to 4 and 6 to 15 of the '771 application proclaim a NETWORK failure when a heartbeat is received from a first network but not from a second separate network, the heartbeats originating from a single process.

As can be clearly seen from the preceding three paragraphs, and from direct comparison of the claims in the two applications, the present invention as claimed differs substantially both structurally and also in terms of method steps and in terms of tests performed and results achieved from the '771 application invention, and the corresponding claims are not at all directly comparable to each other.

For all of these reasons, applicant respectfully requests that the Examiner reconsider his double patenting rejection and allow all the claims without the need for a terminal disclaimer.

E. Rejection Under 35 USC §102(e)

Of the claims that remain in this application, the Examiner has rejected claims 1, 4, 6 to 7, 9 to 10, and 14 to 15 under 35 USC §102(e) as anticipated by U.S. Patent No. 6,088,330 which issued to Joshua Bruck, et al. (hereinafter "the Brook patent"). Applicant respectfully requests

reconsideration of this rejection with respect to these claims as they have been amended in response to the Examiner's double patenting rejection.

The present invention, briefly summarized, correlates heartbeats received from two separate processes residing on two separate hosts and traveling over a single network. The purpose of this correlation is to distinguish between: a network failure, which would prevent any heartbeats from being received; a failure of a first process (or host and process), which would still permit heartbeats to be received from a second process (running on a different host); and the normal condition when heartbeats are received from both processes. Figure 1 illustrates, for example, heartbeats flowing from processes B and C on hosts 2 and 3 flowing over a single network 150 to a process A on a host 1, where the heartbeats are received and analyzed (present application, page 4, lines 15 to 31). Figure 2 illustrates a method for detecting a network failure when no heartbeats are received, and Figures 3 and 4 illustrate methods of detecting a process failure when heartbeats are received from only one process, rather than from two processes.

Contrary to this, the invention described in the Bruck patent does not try and detect process failures, nor does it try and distinguish between process and network failures, as does the present invention. The Bruck patent instead assumes any failure to be a failure of one or more network paths. The Bruck patent focuses upon providing redundant network paths, as is clearly illustrated in Figure 1 of the patent, where each node has two network connections leading respectively to two independent network switches. The present invention contains no such teaching, and Figure 1 of the present application reveals no redundant network paths – only the single network 150. The Bruck patent teaches sending heartbeats over the independent paths connecting each pair of hosts by using packets that are labeled as to the specific path traveled (Col. 11, lines 29-34). The present invention does not require any such complex mechanism for tracing multiple paths and storing the results labeled as to the path taken. In addition, the Bruck patent teaches only that a heartbeat must be received from "each other node each 10 ms." (Col. 11, lines 65-67)

The Bruck patent does not teach detecting process failures, and distinguishing such failures from network failures, by comparing the arrival times of heartbeats coming from different processes running on different hosts, as do all of the independent claims 1, 6, and 9. The dependant claims 4, 7, 10, 14, and 15 are similarly limited. In addition, dependant claim 10 is specific in defining how the measurement of these arrival times is to be carried out and just what is to be compared, something also not taught in the Bruck patent. Additionally, dependant claims 14 and 15 positively identify a network failure (as opposed to a process failure) when no heartbeat is received from either of the two different processes running on different hosts prior to expiration of a heartbeat timeout interval, something not taught in the Bruck patent. Hence, the Bruck patent cannot achieve the goal of the present invention, which is to distinguish between network and process failures, rather than simply signaling a failure without indicating whether it is a network or process failure and leaving one to assume that it is a network failure.

Accordingly, the claims 1, 4, 6 to 7, 9 to 10, and 14 to 15, all rejected as unpatentable in view of 102(e), are believed to be patentable over the Bruck patent reference. Reconsideration of this grounds for rejection is accordingly respectfully requested.

D. Conclusion

Applicant believes that the present application, as amended, is now in condition for allowance. All of the remaining claims 1 to 4, 6 to 7, and 9 to 15 are believed to be allowable for the reasons given above. Early and favorable reconsideration of the application as amended is respectfully requested. The Examiner is invited to contact the undersigned by telephone if a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 08-2025. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit

Account No. 08-2025. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 08-2025.

Respectfully submitted,

Date _June 14, 2004_

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APPENDIX A

Patent Application Serial Number 09/833,771   Filed 04/13/2001

Amended and Allowed Claims 1 to 15:

1. A method of detecting a network failure in a distributed system, the method comprising steps of:

      (1) measuring a first period of time between an instance a last heartbeat was received from a process on a first network and a later instance in time;

      (2) measuring a second period of time between an instance a last heartbeat was received from said process on a second network and said later instance in time;

      (3) comparing said first and second periods of time with a predetermined threshold; and

      (4) determining whether a network failure occurred in response to said comparison in step (3).

2. The method of claim 1, wherein step (3) further comprises steps of:

calculating a difference between said first period of time and said second period of time; and

comparing said difference to said predetermined threshold.

3. The method of claim 2, wherein said step (4) further comprises steps of:

detecting a failure of said second network in response to said difference equaling or exceeding said predetermined threshold.

4. The method of claim 1, wherein said steps are performed as computer-executable instructions on a computer-readable medium.

5. (Cancelled)

6. A method of detecting a process failure in a distributed system, the method comprising steps of:

(1) arranging for a process executing on a first host to generate heartbeats and to apply them to each of at least two networks;

(2) determining whether a heartbeat is received over at least one of said ~~one~~ networks from said process in the distributed system prior to an expiration of a heartbeat timeout; and

(3) detecting a failure of said process in response to not receiving a heartbeat over at least one of said networks prior to said expiration of said heartbeat timeout.

7. The method of claim 6, wherein said steps are preformed as computer-executable instructions on a computer-readable medium.

8. The method of claim 6, further comprising steps of:

(4) if at least one heartbeat is received, determining whether a heartbeat is received over all of said networks; and

(5) detecting a failure of at least one of said networks in response to not receiving a heartbeat over at least one of said networks.

9. A distributed system including a plurality of hosts connected via a plurality of networks, wherein each host executes a process in said distributed system, said system comprising:

a first host of said plurality of hosts executing a first process;

a second host of said plurality of hosts executing a second process, said second host being connected to said first host via at least two networks, and said second process sending out heartbeats over at least two of said at least two networks receivable by said first process;

wherein said first process is operable to detect one of failure of said second process and failure of a first network of said at least two networks, detection of failure of said second process being based on expiration of a period of time without reception of any heartbeats transmitted from said second process, and failure of said first network being based on expiration

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of a period of time with reception of at least one heartbeat transmitted over one of said at least two networks but without reception of any heartbeats transmitted from said second process over said first network.

10. The system of claim 9, wherein

said first host is operable to measure a first period of time between an instance when a last heartbeat was received from said second host on a second of said at least two networks and a later instance in time and to measure a second period of time between an instance when a last heartbeat was received from said second host on said first network and said later instance in time; and

said first host is further operable to compare said first and second periods of time with a predetermined threshold, and detect a failure of said first network in response to said comparison.

11. The system of claim 10, wherein said first host is further operable to calculate a difference between said first period of time and said second period of time, and compare said difference to said predetermined threshold.

12. The system of claim 11, wherein said first host is operable to detect said failure of said first network in response to said difference exceeding said predetermined threshold.

13. The system of claim 9, wherein said first host is operable to determine whether a heartbeat is received from said second host on any of said at least two networks prior to an expiration of a heartbeat timeout.

14. The system of claim 13, wherein said first host is further operable to detect said failure of said second process executing on said second host in response to not receiving a heartbeat from said second host prior to said expiration of said heartbeat timeout.

15. The system of claim 14, wherein said first process is operable to remove said second process from a view in response to detecting said failure of said second process.